NOTES ON A FEW MEDUSÆ NEW TO WOODS HOLL.

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The following notes on a few medusæ taken during the current summer in the region of Woods Holl may serve as a preliminary account of work under way which will present a synopsis of the medusoid fauna of the region and which it is hoped may be ready within the year.

During the summer several expeditions for collecting were made to localities within fifty to seventy-five miles, most of which were made within a single day on board the launch "Phalarope," of the United States Fish Commission Laboratory, under direction of Dr. H. M. Smith, to whose courtesy I am under obligations, as also to Mr. Vinal N. Edwards for many favors.

The first excursion, and the one most prolific in specimens, was made to the region of the Gulf Stream, known as the Tile-fishing Station, latitude 40° 10′ 45″, longitute 70° 20′ 30″, by the schooner "Grampus," Captain Hahn, July 30 to August 2.

The material was taken by means of the tow-net, mostly from the surface, though in a few cases hauls were made from depths of from fifteen to twenty-five fathoms. Further reference to results of these deeper hauls will be made in another connection.

The medusæ taken include representatives of at least twelve genera and probably eighteen species. Several species of siphonophores are as yet undetermined. Specimens of *Oceania languida* and of *Epenthesis foliata* were very abundant, but these were taken most plentifully near Gay Head and No Mans Land. The following named species have been identified and of those not formerly recorded sketches and brief descriptions are given.

Oceania languida, taken in great abundance chiefly from a depth of about fifteen fathoms in water of seventeen fathoms. They were taken in the surface tow but in fewer numbers.

Epenthesis foliata, likewise taken in considerable numbers at similar ranges of depth.

Very few specimens of *Bougainvilla superciliaris* partly from the surface and partly from a lower depth.

Nemopsis bachei, about twenty specimens taken from deeper towing in Vineyard Sound.

Lafœa calcarata taken in surface tow near Gulf Stream. This is more usually a littoral form and its presence at this distance from land is not common. It is fairly common in the surface tow at Woods Holl.

Obelia were found in considerable numbers at the surface and near shore. Several species were taken, two of which, *O. geniculata* and *O. flabellata* were most common.

Aglaura hemistoma, numerous specimens taken at surface near the Gulf Stream. So far as I am aware this is the first record of this medusa within this region. The following cut, Fig. 1,

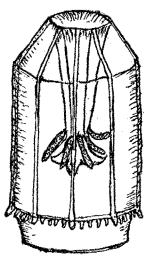

FIG. 1.

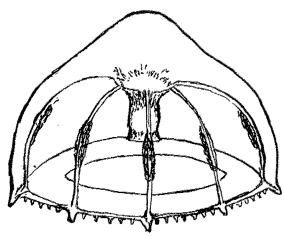

FIG. 2.

will give a good general impression of this beautiful medusa. In size the specimens varied from two to four mm. in height by about half that in width. It was not possible to distinguish any sense organs on the specimens, the preservation in formalin having apparently rendered the otocysts, if present, indistinguishable. Incidentally it may be mentioned that this is a familiar effect with specimens preserved in formalin of any considerable strength. Even in 5 per cent. solutions it has this effect in many cases. The oral end of the manubrium is reddish in color, the gonads, which are borne just above the gastric pouch, are yellowish-white or brownish. The peduncle of the manubrium is long and gelatinous. In the specimens the tentacles had all been apparently broken off close to the margin so that only the short bases were remaining. Radial canals are eight in number and extend downward upon the peduncle.

Several specimens of an interesting Trachynemid were taken in the same locality. Most of them were considerably damaged,

and like the specimens of *Aglaura* were devoid of tentacles. Fig. 2 will give a good impression of the medusa. In size the specimens varied from 6 to 10 mm. in broad diameter by slightly more than half as high. Bell subhemispherical in shape with a solid apical projection. Radial canals eight in number, and with gonads borne about the median region on the under side. Manubrium urn-shaped and with flaring, slightly quadrate lips. Color transparent, with an evident iridescence, manubrium dull white, as are also the gonads in formalin specimens. In most respects it agrees fairly well with the description of *Rhopalonema typicum* Maas. from the west coast of Mexico, and later by Agassiz and Mayer from the tropical Pacific.[1]

While the occurrence of the same species in a comparatively

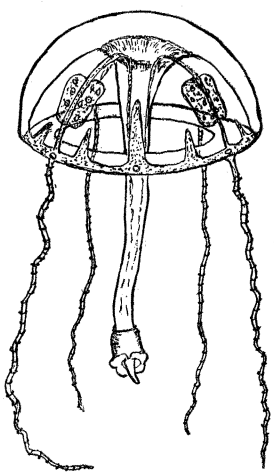

FIG. 3.

high latitude of the Atlantic might seem somewhat improbable, still I am not able to distinguish sufficient differences in specific characters to warrant considering it a new species. As intimated above, the somewhat damaged condition of the specimens and inability to distinguish otocysts may afford characters when determined to justify a different conclusion.

In Fig. 3 is shown another medusa not hitherto recorded from the region. As will be seen it bears some resemblance to the

[1] Cf. Mem. Mus. Comp. Zoöl., Vol. XXVI., No. 3.

Liriope scutigera McCr., but closer inspection will show that in several respects it differs very materially. It would seem to be much closer related to *L. cerassiformis.* Specimens of various sizes showed the various phases in the development and atrophy of the secondary, interradial tentacles, so that in the adult there are only the four perradial tentacles. They were taken in the surface tow near the Gulf Stream. In size the adult specimens were about 10 mm. broad by slightly more than half this height. Bell very transparent, gonads opaque, somewhat shield-shaded, and showing ova in various stages of growth. The centripetal canals were twelve in number, the interradial set being about twice the size of the adradial set. It should be noted that these were exceedingly difficult to distinguish on superficial examination, and this may in part account for their apparent absence in the earlier figures of *L. scutigera.*

In Fig. 4 is shown another medusa taken near No Mans Land

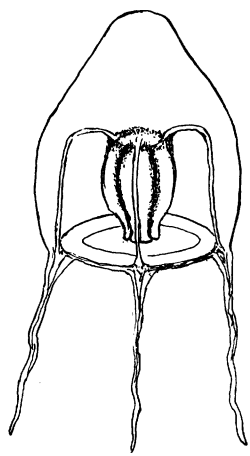

FIG. 4.

on two different occasions during the summer and apparently entirely new to science. Several specimens were taken in the same general locality between that above mentioned and the Gulf Stream. In shape the bell is somewhat oblong, with an extended apical projection. Gastric portion of the manubrium rather large and subquadrate in cross section, mouth simple and with slightly everted lobes; gonads in four rather prominent masses surround-

ing the manubrium. Tentacles four, with rather prominent basal bulbs, hollow, attenuate in shape and densely crowded with nematocysts. Velum well developed; ocelli absent; height of bell 2–4 mm. by about half as broad. Color, bell transparent, gonads and manubrium milky white.

While the medusa has characters which indicate relations with the Codonidæ, *e. g.*, the simple mouth opening, straight, simple tentacles, general shape, etc., it has likewise characters which also point to relations with the Tiaridæ, such as the subquadratic manubrium, lobular arrangement of gonads on the radial sides of the manubrium, and the apical projection of the bell. From a critical comparison of the sum of the characters with Hæckel's description of the genus *Protiara* which he established for a medusa which in general characters appears to have much in common with the one under consideration, it seems to find its place appropriately under this generic head, and may be taken to constitute a sort of connecting link between the two families, since Hæckel designates his as the prototype of the Tiaridæ, and most nearly allied to the Sarsiadæ of any of the Tiarids.

But while undoubtedly allied with *Protiara* it is clearly a distinct species, differing in almost all its specific characters, as color, shape, etc. For the present species I propose the name *P. hæckeli*, in honor of the author of the genus under which it falls.

As intimated above several species of Siphonphores were taken in this collection which have not been determined and since they are not at present accessible further account of them will be deferred till such time as they may have adequate description.

In Fig. 5 is shown an interesting Narcomedusa taken also in surface tow near the Gulf Stream. Only a single specimen was taken and this was slightly damaged and apparently immature, having only four perradial tentacles with what seem to be very small interradial tentacles. As in several of the previously mentioned cases, it was not possible to distinguish any sensory bodies. The specimen is a member of the Solmaridæ, and perhaps belongs to the genus *Solmaris*, but in view of its apparent immaturity, indicated by the absence of gonads and undeveloped interradial tentacles, it seems probable that it may be the young

of some *Solmaris*. It is perfectly evident that in its present stage of development it does not find close relations with any species at present distinguished. Should further collections of other similar specimens of similar characters justify specific distinctness I would propose for the species the name of *S. tetranema*.

A somewhat rare Scyphomedusa for this region was taken near

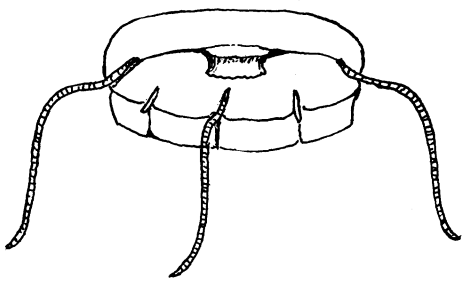

FIG. 5.

the Gulf Stream in the locality indicated in the introductory paragraph, namely, *Pelagia cyanella*. So far as I know the only previous record was of a single specimen taken by the "Fish Hawk" in 1899 in essentially the same region.

The specimen measured about 30 mm. in diameter, being immature, as no marked development of gonads had yet occurred. The previous specimen measured about 50 mm. in diameter and was loaded with well-developed ova apparently ready to be discharged. This is one of the few distinctly pelagic medusæ of this class which occasionally come within the limits of the region, and is at the same time one of the most beautiful, rivalling *Dactylometra*, if not surpassing it in the richness and delicacy of its coloring and grace of form. A fuller description of the medusa will be given in a later contribution.

In this connection may be described an interesting medusa taken in the tow in Great Harbor, Woods Holl, on the evening of August 16. Its general form is well illustrated in Fig. 6. The following brief characters may further differentiate it: Bell subrectangular in profile with a slight apical projection, bell walls rather thin and very transparent, capable of great contraction in both directions; radial canals four, rather wide and simple; manubrium sessile, with broad base and tapering to a terminal

oral orifice which is simple and slightly four lobed. Tentacles four, unequally developed, probably due to immaturity. The two on opposite sides (right and left of the figure) presenting the relative size and form, which are quite unique among medusæ of this family (the Codonidæ), though somewhat like greatly exaggerated tentacles of *Dipurena*. In addition to the enlarged terminal knobs which are densely packed with nematocysts, each teniacle has a distinct ring of nematocysts about the middle of the stalk as shown in the figure. In size the medusa measured in life about 2 mm. in height by about 1.5 mm. in breadth. The

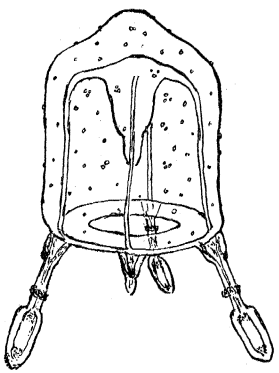

FIG. 6.

exumbrellar surface was irregularly and sparingly dotted with minute clusters of nematocysts. In color the specimen was brilliantly marked, the terminal bulbs of the tentacles being at the apex brilliant carmine tinged with green, and their basal portion duller reddish-brown; the basal bulbs similarly reddish-brown with a dense black ocellus on the outer side. The manubrium was tinged with pale green. It should have been said that the two undeveloped tentacles were not equally so, one being in all but size quite like the larger pair while the smaller one, though much smaller than the other, was evidently lacking in age only to attain to the size and form of the others.

The specimen (only a single one being taken) bears indications of immaturity; *e. g.*, the unequally developed tentacles, absence of distinct gonads, and the nematocysts of the exumbrellar surface. In view of the similarity of swimming habit, coloration,

and the general aspect of tentacles, the first thought was of its possibility as the very young of *Dipurena*. A careful study of the bell form, as well as that of the manubrium, and the remarkable development of the tentacular knobs, all are fundamentally unlike *Dipurena*. And while apparently a young specimen it may be doubted whether in all essential respects it is not fairly adult in morphological aspects. I am therefore disposed to regard it as entitled to both generic and specific distinctness, and propose for it, at least provisionally, the name *Dipurella clavata*.

Cruises were made off Nantucket southward on August 13, and off Chatham at "crab ledge" August 19 secured a medusoid fauna in many regards different from that of the former. *Oceania* and *Obelia* were found in about the same numbers as before, but there was a noticeable absence of all those distinctively tropical in their ranges.

On the other hand here were the outliers of an arctic fauna as indicated in such forms as *Pleurobrachia* and *Beroe* among Ctenophores, *Tealia crassicornis*, *Bunodes stella*, among actinians, *Solaster* among starfishes, etc., while of medusæ were found *Hybocodon*, *Corymorpha* and *Trachynema* chiefly.

The occurrence of *Hybocodon prolifer* at this season was quite a surprise, as so far as I am aware its occurrence has been recorded chiefly, if not wholly, during the very early spring. It was in perfect sexual maturity and also budding medusæ proliferously from the base of the tentacle. An interesting condition of these specimens was the absence of the bright orange-red coloration which is so marked a feature of the early spring forms, and with it also the absence of the exumbrellar bands of nematocysts. But for the fact that I have often noted the gradual decline of this feature in late spring specimens I should have felt disposed to consider the specimens taken on this cruise to be of a distinct species. It is not altogether improbable that similar features in the seasonal variation of other medusæ may have been the occasion of thus specifically differentiating one and the same organism.

Here also I took for the first time during the summer the medusa of *Corymorpha pendula*. In general aspects it is much like *Hybocodon* and I am disposed to favor Haeckel's assignment

of this medusa to the latter genus. While less marked by asymmetry than is *Hybocodon*, and while having only one perfectly rudimentary tentacle, these do not seem sufficient grounds upon which to establish a distinct genus.

Another interesting medusæ taken at both these stations and apparently a new species, is closely related to *Trachynema digitale*, and was at first considered to be the young of this species. A closer examination, however, showed it to be quite specifically distinct. Fig. 7 will afford a good general impression of the morphological aspects of the medusa. In size it averages about five to six mm. in height, by three mm. in width of bell. This of itself might not justify the conclusion of specific distinction, still as an average of about fifty specimens, taken at considerable distances and at an interval of nearly a fortnight, it would strongly warrant such a probability, when we know the

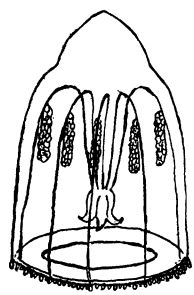

FIG. 7.

former species to have an average of from twenty-five to thirty-five mm. in bell height by about half that width.

Again the color of the former species is quite strongly in contrast with that of the medusa under consideration. In *T. digitale* the bell is said to be light pink, the manubrium reddish and the tentacles at the contracted tips also red. The present species is wholly devoid of color, except for the slightest tint of pinkish iridescence which at times appears under favorable circumstances.

Haeckel has placed Agassiz' species under a different family, the Aglauridæ, and under the new genus *Aglantha*. This readjustment is apparently well founded, and I, therefore, incline to

accept it and to propose for the species under consideration the name *Aglantha conica* the specific name designating the somewhat typical cone shape of the medusa.

The following specific diagnosis briefly summarizes the more distinctive characters of the medusa: Bell high with rather sharp apical projection slightly constricted just above the bell cavity. Manubrium long and with elongate gelatinous peduncle; gastric region only about one fourth as long as the former and with prominent four-lobed lips, the whole organ about three fourths as long as the bell cavity. Radial canals eight, extending the length of the peduncle. Gonads eight, cylindrical and suspended from the upper portion of the bell cavity under the canals. Velum well developed and apparently strongly functional as the organ of locomotion; movements of the medusa active and erratic, darting arrow-like when disturbed; bell walls thin with tendency to wrinkle longitudinally when placed in formalin. Tentacles apparently numerous, though mostly lacking, only the bases generally distinguishable; those present were short and rather blunt. No marginal organs or otocysts distinguishable.

The specimens were taken with the open tow-net at a depth of from twelve to sixteen fathoms. Many of the specimens were sexually mature, some females discharging eggs. Both sexes apparently present and in about equal numbers.

These observations would seem in the main to confirm the earlier records of Stimpson, Agassiz, Verrill, Packard and others that the point of Cape Cod marks a limit more or less definite, between a boreal, or "Acadian," and a "Virginian" fauna which pertains to not only cœlenterate life but to a considerable range of invertebrates. Undoubtedly the configuration of the coast line and its associated topography in their influence on the various currents are important factors in the faunal ranges which are under consideration.

In this connection may be discussed another point to which previous reference has been made, namely, the varying depths from which our hauls were made. I regret to say that the nets were only of the ordinary open sort, which therefore precludes anything like exact data, but the repetition of hauls at the same

place and from varying depths and a careful comparison of results afford a rough approximation toward an estimate of the relative abundance of life at given depths as compared with the surface, as well as the varying kind of life at the several depths.

In the more open ocean and in the region of the Gulf Stream the larger number and variety were obtained almost entirely from the surface. In the regions of No Mans Land, Nantucket, Chatham Ledge, Vineyard Sound and Buzzard's Bay, on the other hand, a greater abundance and variety of medusæ were obtained from a depth of from 10 to 15 fathoms in water of 17 to 25 fathoms than from either the surface or the bottom. This was more particularly true in rough water and during midday or in bright sunshine. Surface towing during late evening or on dark days most generally give a much larger average in the abundance and variety of species.

In a general way these results, which I have often observed also in previous years, confirm the observations of others and tend to establish what may be considered a law of pelagic life in its relations to light and other aspects of surface environment. At the same time it should not be overlooked, that occasionally there seem to be marked exceptions to such a law. I have taken at times these same forms from the surface in almost incredible abundance, so abundant indeed that with an ordinary pail one might take hundreds at a single dip. Whether sexual conditions, as Agassiz has suggested, or some other condition at present imperfectly known or understood may not be involved it may remain for the future to determine. That sexual conditions *alone* are determining factors seem to me more than doubtful. I should rather incline to consider temperature or tidal currents as probably important factors in the case, just as it seems to me that prevailing winds and currents account for the presence of large numbers of *Aurelia*, *Cyanea*, or other of the Scyphomedusæ, in bays or protected harbors rather than that such segregations are for breeding purposes.

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September 2, 1902.